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City, State, ZIP	1450 Enea Circle, Suite 550 Concord, CA 94520-7996

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**1. Article Addressed to:**

Ms. Lisa Matta  
Department of Industrial Relations  
Division of Occupational Safety and Health, PSM R6 D3  
1450 Enea Circle, Suite 550  
Concord, CA 94520-7996

**2. Article Number**

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7009 2820 0004 4466 3373

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*R. Duesach*

☐ Agent

☐ Addressee

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*R. Duesach*

**C. Date of Delivery**

*4/6/10*

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PS Form 3811, February 2004

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**Chevron Products Company**  
841 Chevron Way  
Richmond, CA 94801

Tom DiPalma  
Tech Center 3<sup>rd</sup> Floor

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Inspection # - Chevron Rich.  
Refinery*

CUSA-CSB-0082127

EPA



**J. W. Hartwig**  
Manager

**Health, Environment &  
Safety**  
Chevron Products Company  
P. O. Box 1272  
Richmond, CA 94802-0272  
Tel 510 242 1400  
Fax 510 242 5353  
jwha@chevron.com

November 19, 2010

Ms. Lisa Matta  
Department of Industrial Relations  
Division of Occupational Safety and Health  
PSM R6 D3  
1450 Enea Circle, Suite 550  
Concord, CA 94520-7996

**Cal/OSHA Document Request – Inspection #314325168 – Chevron Richmond Refinery**

Dear Ms. Matta:

The attached accident investigation report satisfies Item 1 on page 1 of Cal/OSHA's Document Request dated October 26, 2010. As agreed to with Mr. Thomas DiPalma of my staff, we are submitting the accident investigation report by November 19, 2010.

**1. Copy of Accident Investigation**

A copy of the accident investigation report is attached.

For reference, below is a list of abbreviations used in the investigation report (listed in the order that they appear):

- FCC=Fluid Catalytic Cracker
- LCO=Light Cycle Oil
- B&S = Blending and Shipping
- SME = Subject Matter Expert
- LPS = Loss Prevention System
- W/O=Work Order
- AOV=Air Operated Valve
- LPO=Loss Prevention Observation
- HO = Head Operator
- CFD = Chevron Fire Department
- USW=United Steel Workers
- C/A = Corrective Action

Ms. Lisa Matta  
Department of Industrial Relations  
PSM R6 D3  
November 19, 2010  
Page 2

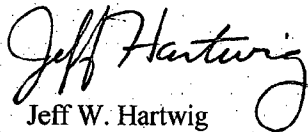
The following immediate corrective action was taken following the incident that occurred on October 17, 2010:

1. A Safety Stand-Down was held with the operating crew following this incident and the crew discussed the appropriate reaction to the situation and the need to be extra diligent once the cleanup process was resumed. No further action was required on V-102B and the strainer basket other than to clean up the area.

The Richmond Refinery considers all or part of the attached information to be Confidential Business Information (CBI) under both California and federal law. As a consequence, the Richmond Refinery requests that Cal/OSHA maintain the attached information indefinitely as CBI and requests immediate notification if Cal/OSHA disagrees with this request.

For questions, please contact Mr. Thomas DiPalma at (510) 242-2233.

Sincerely,

  
Jeff W. Hartwig

Attachment



## Memorandum

To Doug Fryer  
Bruce Chinn  
Mike Coyle  
From Tim Potter / Mike Baer  
Date 18 November 2010  
Re Completed TapRooT® Investigation – IMPACT ERM #503

**Event Title:** Two operators burned during FCC cleanup

**IMPACT Record Number(s):** 503

**PSM Event:** No

**PSM Near Miss:** No

**RISO MCAR Event:** No

**RISO MCAR Near Miss:** No

### 1. Incident Summary:

While unlatching the strainer basket under V-102B coke pot, wash water sprayed out of the strainer basket enclosure onto two operators. Both operators received burns and were treated on the scene by Chevron Fire Department (CFD) personnel. One operator was transported to the hospital via ambulance. The other operator was treated at the refinery clinic and released back to work. This employee subsequently entered a program that guarantees privacy.

### 2. Initiating Event:

Wash water sprayed out of V-102B strainer basket enclosure onto two operators as they unlatched the strainer basket.

### 3. Incident Description:

This incident took place while operators were cleaning up the C-90 bottoms system to prepare the FCC for a major turnaround. The operators were following the shutdown procedure that required oil washing, water washing and steaming the plant to prepare it for chemical cleaning. The C-90 bottoms system was under approximately 15# of steam pressure, which is the normal and expected pressure range while water washing and steaming this system.

Operations personnel had already cleaned 7 of the 8 strainers in the C-90 bottoms system and the two operators were in the process of cleaning the last Fractionator Bottoms Strainer (V-102B). This cleaning procedure included steaming V-102B for approximately 30 minutes and blocking in the isolation valve at the bottom of V-102B. After steaming out V-102B and isolating the valve, they were unlatching the strainer basket under V-102B so they could remove the strainer basket. While unlatching the strainer basket, hot wash water sprayed from the strainer basket enclosure resulting in burns to both operators.



The less seriously injured operator helped the other operator to the nearest safety shower. Operations personnel called CFD and CFD immediately responded to the scene. One operator was transported to the hospital via ambulance. The other operator was treated at the refinery's clinic, released back to work and subsequently entered into a program that guarantees privacy.

Post incident examination of the V-102B strainer basket showed that the strainer basket was plugged with a mixture of catalyst, water and oily residue. The investigation team was told that catalyst fines, when mixed with water, may form a paste. A paste-like material was found on the seating surfaces at the top of the strainer basket. The investigation team hypothesized that the paste-like material plugged the strainer basket and the strainer basket seating surfaces, and together with the steam pressure, allowed the wash water to spray out while the strainer basket was being unlatched.

The strainer baskets were installed on the Fractionator Bottoms Strainers (V-102A/B and V-106A/B) and P-105 Suction Strainers (V-105A/B/C/D) in 2005 to prevent coke from reaching the process sewer system, ensure compliance with environmental regulations, and ensure employee safety by preventing liquid from splashing up from the process sewer. This was the first turnaround where the strainer baskets were used to clean the C-90 bottoms system since the 2005 C-90 bottoms system redesign.

- V-102A/B and V-106A/B strainers are located on the discharge of the Fractionators Bottoms pumps. The four strainers are grouped in two parallel sets. Each strainer is capable of handling 50% of the flow from the Fractionator bottoms. In each set, routine operation entails having one strainer in service and the other strainer either being cleaned or in standby mode.
- V-105A/B/C/D strainers are located on the suction of the Fractionators Bottoms pumps. The four strainers are in parallel and grouped in two sets. Each strainer is capable of handling 50% of the flow from the Fractionator bottoms. In each set, routine operation entails having one strainer in service and the other strainer either being cleaned or in standby mode.

a. **On-Site Impact:** No additional on-site impact resulted from this incident.

b. **Off-Site Impact:** No off-site impacts resulted from this incident.

#### 4. What Went Well:

The less seriously injured operator helped the other operator to the nearest safety shower. CFD was notified of the incident and immediately provided initial medical treatment to the injured operators.

#### 5. Immediate Corrective Actions:

A Safety Stand-Down was held with the operating crew following this incident and the crew discussed the appropriate reaction to the situation and the need to be extra diligent once the cleanup process was resumed. No further action was required on V-102B and the strainer basket other than to clean up the area.



#### 6. Root Causes & Corrective Actions:

The Investigation Team identified five potential causal factors. These causal factors relate to:

- The cleanup for the Turnaround caused an unexpected and unanticipated volume of catalyst to plug the strainer baskets;
- This is the first Turnaround where the strainer baskets were being used for cleaning the C-90 bottoms system strainers;
- The current written Job Aid did not address the unexpected and unanticipated volume of catalyst to the strainer basket;
- Operations personnel indicated that during the last few months of the FCC run they noticed more plugging in the strainer baskets, due to an increased amount of catalyst present. There were several events where steam and hot vapors came out of the strainer baskets during routine cleaning. These events were not reported until after this incident;
- Although expected by Refinery practices, operations personnel did not document near loss reports of similar incidents in the Richmond Refinery's Incident Reporting database.

Each of these causal factors, as well as, additional considerations are covered below.

##### Causal Factor #1 - The cleanup for the Turnaround caused an unexpected and unanticipated volume of catalyst to plug the strainer baskets

The strainer baskets were designed to prevent coke from reaching the process sewer during routine operation. As noted above, this was the first time that the C-90 bottoms system was cleaned up for a turnaround since the strainer baskets were redesigned in 2005.

##### Root Cause Analysis

Applicable TapRooT question – *None* (identified as an Equipment Difficulty issue)

TapRooT Basic Cause Category – *Design*

TapRooT Near Root Cause Category – *Design Specifications*

TapRooT Root Cause Category – *Problem Not Anticipated – Equipment Environment Not Considered*

##### Corrective Action

Perform a design review of the strainer baskets on V-102s / V-105s / V-106s and implement any changes to ensure the design can handle not only routine operating conditions, but also:

- conditions with higher than routine catalyst carryover and
- turnaround and cleanup operating conditions.



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Causal Factor #2 - This is the first Turnaround where the strainer baskets were being used for cleaning the C-90 bottoms system strainers

This was considered a dual Causal Factor because of the design issue addressed in causal factor #1 and the turnaround clean up procedure (FCC-NP-3106) did not address the unexpected and unanticipated catalyst carryover through these vessels that can occur during a turnaround plant clean up.

Root Cause Analysis

Applicable TapRooT question – *Were policies, administrative controls, or procedures not used, missing, or in need of improvement*

TapRooT Basic Cause Category – *Procedures*

TapRooT Near Root Cause Category – *Procedures Missing*

TapRooT Root Cause Category – *Situation not covered*

Corrective Action

Revise the shutdown procedure (FCC-NP-3106) to address the steps needed to water wash through C-90 bottoms system and the strainer baskets associated with the Fractionator Bottoms Strainers as well as the P-105 Suction Strainers, and the hazards that may be associated with unanticipated and unexpected increased volume of catalyst in the strainer baskets. The revised procedure must also include a review of personal protective equipment and a discussion about appropriate precautionary actions.

Causal Factor #3 – The current written Job Aid did not address the unexpected and unanticipated volume of wash water and catalyst to the strainer basket

There was no separate training material for how to perform this task during turnaround conditions. Operators were used to switching and cleaning the Fractionator Bottoms Strainers as well as the P-105 Suction Strainers on a weekly basis under routine operating conditions. However, those conditions differed from those experienced by the operators while cleaning up the C-90 bottoms system to prepare for a major turnaround.

Root Cause Analysis

Applicable TapRooT question – *Were policies, administrative controls, or procedures not used, missing, or in need of improvement*

TapRooT Basic Cause Category – *Procedures*

TapRooT Near Root Cause Category – *Procedures Missing*

TapRooT Root Cause Category – *Situation not covered*

Corrective Action

Change the existing Job Aid to a Procedure that addresses routine as well as turnaround operations. The procedure will include a warning regarding the potential for catalyst carryover and the hazards associated with plugged strainer baskets. Additional corrective actions may be necessary depending





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upon the Design Review proposed in Causal Factor #1 and should be covered in that Design Review.

Causal Factor #4 – Subsequent to the accident, operations personnel indicated that they had noticed during routine operation an increased amount of catalyst being collected in the strainer baskets and steam and hot vapor coming from the strainer baskets as they were being unlatched for routine cleaning since plant upsets earlier in 2010.

After this incident, Operators reported that they had seen more catalyst carryover when they were performing the routine duty of switching strainers during normal operations. These reports included examples of steam condensate and Light Cycle Oil (LCO) vapor coming from the strainer baskets as they were unlatched for routine cleaning. This should have been an indication to the operations personnel that conditions have changed and should have been shared with management to enable corrective adjustments.

Root Cause Analysis

Applicable TapRooT question – *Did the person need more skill or knowledge to perform the job or to respond to conditions or to understand system response?*

TapRooT Basic Cause Category – *Training*

TapRooT Near Root Cause Category – *Understanding Needs Improvement*

Corrective Action

Share the lessons learned from this incident and emphasize how changes in work conditions can pose additional risks.

The Corrective Actions proposed for Causal Factor #2 and #3 plus the steps that the Refinery is already taking to improve the near loss reporting system also address this Causal Factor.

Causal Factor #5 – Although expected by Refinery practices, operations personnel did not document near loss reports of similar incidents in the Richmond Refinery's Incident Reporting database.

Information obtained following the incident indicated there may have been previous close calls where the strainers had plugged before or where there was the potential for other operators to have come into contact with hot liquid. If these close calls were reported, then corrective actions could have been implemented to prevent similar incidents, including this one.

Root Cause Analysis

Applicable TapRooT question – *Had management been warned of this problem or had it happened before?*

TapRooT Basic Cause Category – *Management System*

Near Root Cause Category – *Standards, Policies, or Administrative Controls Need Improvement*

TapRooT Corrective Action



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There is no separate corrective action proposed for this Causal Factor – the Refinery is already engaged in steps to improve the near loss reporting system.

**7. References & Attachments:**

Appendix I - Tap Root® Events & Causal Factors Chart

Appendix II - Root Cause Analysis®

**8. Additional Information:**

**Investigation Team:**

<u>Name</u>	<u>Discipline / Role</u>	<u>Current Position</u>
Tim Potter	Team Lead	B&S Area Business Manager
Mike Baer	TapRoot Facilitator	Safety / PSM Specialist
Tom DiPalma	Team Member	Safety Team Lead
Mark Materne	Team Member / Area SME	Maintenance Work Control
Ray Wiles	Team Member	USW Health and Safety Rep

**Date & Time Event Began:**

The incident happened on October 17, 2010 at 22:30.

**Date & Time Investigation Started:**

The incident investigation began after the injuries of October 17, 2010.

The investigation team met for the 1<sup>st</sup> time on October 18, 2010 at 14:00.

**Type of Incident (From II&R Matrix):**

This was a level 3A incident – based upon the injuries to one employee.

**Management Sponsor:**

Doug Fryer (acting Area Business Manager)

Rick Smith (Cracking Section Head)

**Tenets Compromised:**

Tenet 2 – Always operate in a safe and controlled condition

Tenet 8 – Always address abnormal conditions

**OE Processes Compromised:**

Safe Operations

**On Site Emergency Response:**

Chevron Fire Department personnel were called and immediately provided initial treatment to the two injured operators.



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**Agencies Notified, including time of Notifications:**

Cal-OSHA was timely notified as a result of this incident at, or about, 07:20 on October 18, 2010.

**Off-Site Emergency Response:**

No off-site emergency response was required for this incident.

**Communication Plan:**

An LPS Alert has been issued for this incident.

An LPS Bulletin is required for this incident – corporate expectation for Level 3 incidents

**Report Approved by, Position & Date:**

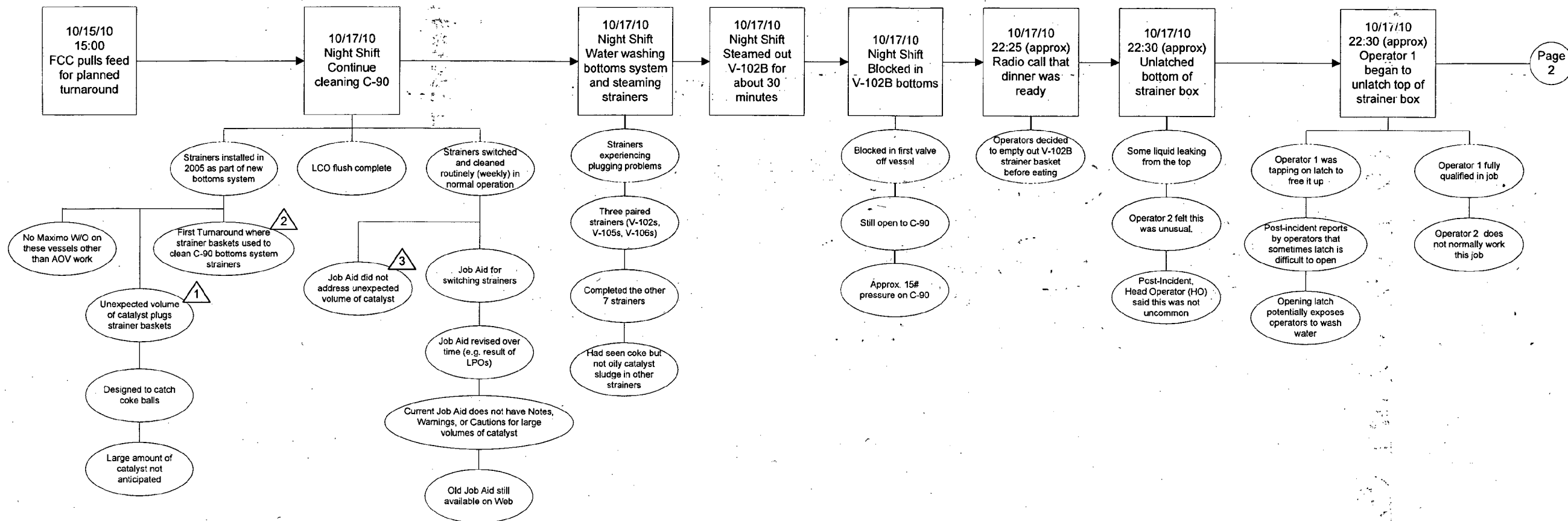
Mike Coyle, Refinery Manager, Nov 18, 2010

**Cc:** Investigation Team Members, HES Manager, Ref. Incident Coordinator, Ref. PSM Coordinator

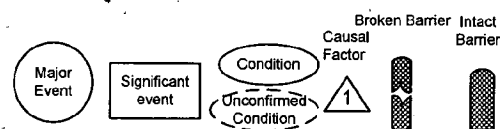
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Tap Root Appendix I

# Events and Causal Factors Chart V-102B – Two Operators Sprayed with Hot Oil and Wash Water



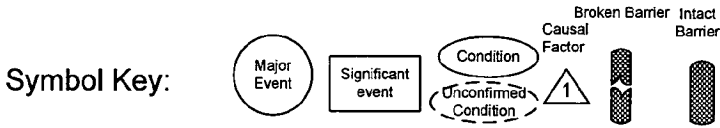
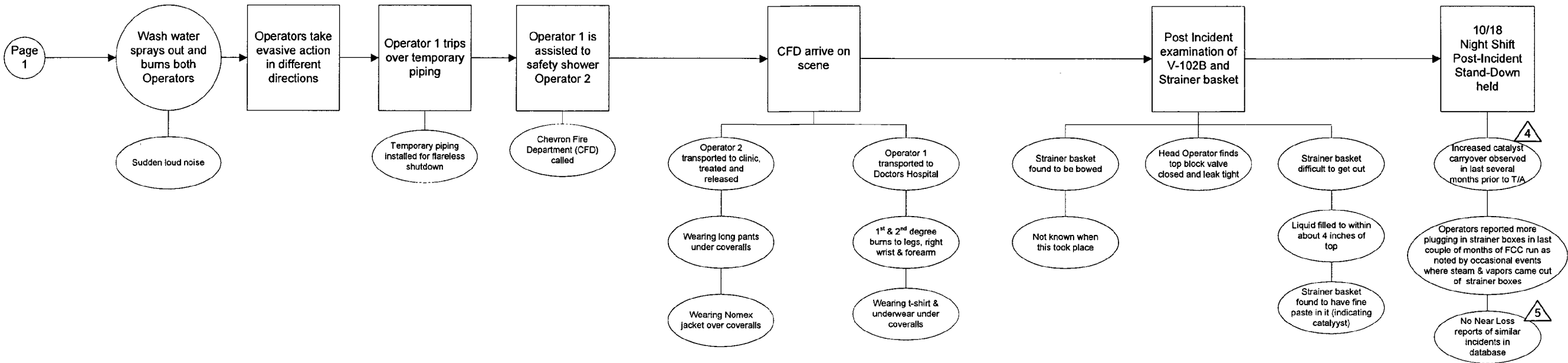
Symbol Key:



Chevron Richmond Refinery  
Draft - Rev-Final  
Date 11/18/10

CUSA-CSB-0082137  
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Events and Causal Factors Chart  
V-102B – Two Operators Sprayed with Hot Oil and Wash Water



Event Title:  
Appendix II RooT Cause Analysis®

**Causal Factors are problems (whether conditions or events) that, if eliminated, would have prevented the incident from occurring or would have significantly mitigated its consequences.**

**Causal Factor #1:** The cleanup for the Turnaround caused an unexpected and unanticipated volume of catalyst to plug the strainer baskets

**Background:** This is seen as a Causal Factor because the strainer baskets were designed to prevent coke from reaching the process sewer during normal operation and were not designed to deal with the water wash and catalyst carryover from the C-90 bottoms system during a turnaround plant clean up. This was the first time that the C-90 bottoms system was cleaned up for a turnaround since the strainer baskets were redesigned in 2005

Condition	Guide	Basic Cause Category	Near Root Cause	Root Cause	Management System Affected (if any)	C/A	Assigned To Due By
Equipment Difficulty	Not Applicable	Design	Design Specs	Problem Not Anticipated – Equipment Environment Not Considered	Safe Operations	Perform a design review of the strainer baskets on V-102s / V-105s / V-106s and implement any changes to ensure the design can handle not only normal operating conditions, but also: <ul style="list-style-type: none"><li>conditions with higher than normal catalyst carryover and</li><li>turnaround and cleanup operating conditions</li></ul>	Karla Salomon 3/31/11

**Causal Factor #2:** This is the first Turnaround where the strainer baskets were being used for cleaning the C-90 bottoms system strainers.

**Background:** This was considered a Causal Factor for two reasons. Firstly there was the design issue – see Causal Factor #1 (above). Secondly, the shutdown clean up procedure (FCC-NP-3106) does not cover the potential hazards of water washing through these vessels in detail and also does not address the possibility that these strainers and their associated strainer baskets will see more catalyst during this type of cleanup process.

Condition	Guide	Basic Cause Category	Near Root Cause	Root Cause	Management System Affected (if any)	C/A	Assigned To Due By
Equipment Difficulty	Not Applicable	Design	Design Specs	Problem Not Anticipated – Equipment Environment Not Considered	Safe Operations	See Causal Factor #1	
Human Performance Difficulty	Were policies, administrative controls, or procedures not used, missing, or in need of improvement?	Procedures	Procedures – Missing	Situation not covered	Safe Operations	Revise the shutdown procedure (FCC-NP-3106) to address the steps needed to water wash through C-90 bottoms system and the strainer baskets associated with the Fractionator Bottoms Strainers as well as the P-105 Suction Strainers, and the hazards that may be associated with unanticipated and unexpected increased volume of catalyst in the strainer baskets. The revised procedure must also include a review of personal protective equipment and a discussion about appropriate precautionary actions.	Karla Salomon 3/31/11

**Causal Factor #3:** The current written Job Aid did not address the unexpected and unanticipated volume of wash water and catalyst to the strainer basket.

**Background:** This was considered a causal factor because there was no separate training material for how to perform this task during turnaround conditions. Operators were used to switching and cleaning the Fractionator Bottoms Strainers as well as the P-105 Suction Strainers on a weekly basis under normal operating conditions. However, those conditions differed from those experienced by the operators while cleaning up the C-90 bottoms system to prepare for a major turnaround.

Condition	Guide	Basic Cause Category	Near Root Cause	Root Cause	Management System Affected (if any)	C/A	Assigned To Due By
Human Performance Difficulty	Were policies, administrative controls, or procedures not used, missing, or in need of improvement?	Procedures	Procedures – Missing	Situation not covered	Safe Operations	Change the existing Job Aid to a Procedure that addresses routine as well as turnaround operations. The procedure will include a warning regarding the potential for catalyst carryover and the hazards associated with plugged strainer baskets. Additional corrective actions may be necessary	Karla Salomon 1/31/11

Event Title:  
Appendix II Root Cause Analysis®

						depending upon the Design Review proposed in Causal Factor #1 and should be covered in that Design Review.	
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**Causal Factor #4:** Subsequent to the accident, operations personnel indicated that they had noticed during routine operation an increased amount of catalyst being collected in the strainer baskets and steam and hot vapor coming from the strainer baskets as they were being unlatched for routine cleaning since plant upsets earlier in 2010.

**Background:** After this incident, Operators reported that they had seen more catalyst carryover when they were performing the routine duty of switching strainers during normal operations. These reports included examples of steam condensate and Light Cycle Oil (LCO) vapor coming from the strainer baskets as they were unlatched for routine cleaning. This should have been an indication that conditions have changed and should have been shared with the organization so that adjustments to the job aid or system could be made.

Condition	Guide	Basic Cause Category	Near Root Cause	Root Cause	Management System Affected (if any)	C/A	Assigned To Due By
Human Performance Difficulty	Did the person need more skill or knowledge to perform the job or to respond to conditions or to understand system response?	Training	Understanding Needs Improvement	---	Safe Operations	Share the lessons learned from this incident and emphasize how changes in work conditions can pose additional risks.	Tim Potter 1/31/11

**Causal Factor #5:** Although expected by Refinery practices, operations personnel did not document near loss reports of similar incidents in the Richmond Refinery’s Incident Reporting database.

**Background:** This was considered a causal factor Information obtained following the incident indicated there may have been previous close calls where the strainers had plugged before or where there was the potential for other operators to have come into contact with hot liquid. If these close calls were reported, then corrective actions could have been implemented to prevent similar incidents, including this one.

Condition	Guide	Basic Cause Category	Near Root Cause	Root Cause	Management System Affected (if any)	C/A	Assigned To Due By
Human Performance Difficulty	Had management been warned of this problem or had it happened before?	Management System	Standards, Policies, or Administrative Controls Need Improvement	---	Safe Operations	There are no separate Corrective Actions proposed for this Causal Factor – the refinery is already engaged in steps to improve the near loss reporting system.	